

When User Experience Design Meets LMS Desktop Users: How to Mitigate Mobile-Oriented Interface?

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User experience design (UX design) of Learning Management Systems (LMS) is recently becoming more mobile device oriented, since large numbers of users are using mobile devices (smartphones primarily) to access learning content and activities. In this paper we will give an overview of device and platform use at the large HEI in Croatia (Faculty of Humanities and Social Sciences, University of Zagreb), based on 3-year survey of first year undergraduate students (over 2100 respondents) as well as the possible steps to mitigate the issues with the mobile-oriented LMS interface (Moodle 4.x) when used on desktop devices. While move to the mobile-oriented interface design is helping most of the users, some of the teachers and content creators, who by default need to use desktop devices (PCs and laptops) have experienced certain issues with LMS usage: too large fonts and icons (designed for touchscreen and small screen devices), several features and navigation elements no longer initially visible (needs for additional interface clicks and new menus) and so on. Most of those issues could be mitigated using customized interface themes and modifications, but some require organizational and methodical changes that we will discuss in detail.

Keywords – UX design; LMS; mobile access; MOODLE;

I. INTRODUCTION

User experience design (UX design) of Learning Management Systems (LMS) is recently becoming more mobile device oriented, since large numbers of users are using mobile devices (smartphones primarily) to access online content, from regular browsing to learning content and online activities. The available statistics for the past 12 months (January 2022 - January 2023) are showing that the global mobile market share has reached 59.76% and desktop market share stands at 40.24% [1]. Both the screen size and orientation of the screens are playing an important role when considering the mobile end-user experience (both teachers/content creators and students/learners) - mobile screens are smaller than desktop screens and their orientation is vertical (most of the time, especially for the mobile phone users). Tablet screens and their users face additional issues, since they are usually larger than mobile phone screens, but still closer to some desktop/laptop screens size and part of the time they are also used in horizontal/landscape mode.

There are numerous UX definitions, and they vary from describing what UX is not - guessing what your user need, web development, interface aesthetics or information technology itself [2], visual design or service

design [3] or what it should not be confined to: pure usability [4], and the International Organization for Standardization defines the user experience as a “person’s perceptions and responses resulting from the use and or expected use of a product, system or service.” [5], and that, according to Jusoh, Almajali and Abu Albasal includes “the user’s emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours [...] that occur before, during and after use” [6] of a certain system, interface, service. Of course, UX usually includes most of the things that are usually dismissed in those definitions (usability, web development, interaction design, visual design...), but it still should not be limited or perceived like just one of those facets and parts, while excluding or omitting others.

Morville’s model describes that notion best by using the famous UX honeycomb [4]:



Figure I. UX honeycomb [4]

in which different facets: useful, usable, desirable, valuable, findable, accessible and credible can help UX designers and other people involved in the process to define their priorities. While all facets cannot always be balanced and prioritized and equally developed, they should all be taken into consideration, to a varying degree (depending on the organization / software needs/priorities).

Learning management systems (LMS) are web-based software platforms that provide the access to and delivery of online content and activities for learning purposes, facilitating the delivery of online, face-to-face or blended

courses [7], [8]. They accomplish that by organizing content and activities into separate courses with their respective teachers and students enrolled in them, enabling communication, tracking of student progress, activity completion and grades, providing access to content in a structured way combined with almost 24/7/365 availability (but there are caveats to that availability such as: motivation, network and infrastructure readiness as well as time available to students and teachers). Their usage has grown considerably in the past 20+ years, and one of the LMS solutions with the largest user base, and open source LMS MOODLE [9], has been installed on over 165.000 sites with over 43.300.000 courses and more than 350.000.000 users globally [10].

Faculty of Humanities and Social Sciences University of Zagreb (FHSS) is the largest higher education institution in Croatia which carries out research activities and has over 100 university programs in the field of humanities and social sciences (undergraduate, graduate and postgraduate levels). The FHSS is a part of the University of Zagreb, the oldest university in Croatia and one of the oldest universities in Europe, and has over 7000 students, more than 800 teachers and 700+ external associates.

E-learning and educational technology implementation at FHSS began in 2002. as a part of the Ministry of Science and Technology project "Organization of Information and Knowledge in the Electronic Learning Environment" (OIZEOO) [11], and it resulted in the faculty-wide implementation of MOODLE based LMS called Omega (<https://omega.ffzg.hr>). In January 2023, LMS Omega has over 9.800 users, out of which there are 700 teachers and over 600 external associates teaching on 4.500+ online courses. All the support, internal development and implementation of the educational technologies and services at FHSS is done by FHSS E-learning Support Center (ESC). Since August 2022, LMS Omega has been running MOODLE version 4.x, which has undergone long-term and serious UX design and development by the MOODLE HQ (creators of the software) in cooperation with the wider global community, with improvements and changes in new primary navigation, new secondary menus and course components, improved student and mobile experiences [12].

After the upgrade of LMS Omega to MOODLE 4.x in August 2022, and the basic introduction of users to the new interface and UX through webinars and workshops (both teachers and students), a number of complaints and comments were received regarding the changes. As usual, with the significant changes to the organization and look of the interface, some of those complaints were resolved quickly with creation of additional instructions (text, video and animations). But some of those complaints persisted, and ESC was not able to resolve all of them with additional education and instruction for users. Most of the complaints came from teachers and content creators using the desktop or laptop devices (computers), because the UX / UI in Moodle 4.x is more oriented on mobile device users (largely student population), and it ranged from too large fonts and icons (which can easily be solved using

internet browser font size commands), several important features and navigation elements no longer initially visible to the user (needs for additional interface clicks and introduction of new drop-down menus instead of navigational blocks on the left or right side of the screen) and course content being "too tall" - because the approximate 30% increase in height of the resource and activity names visible on the homepage of the course. Students and other users who accessed the LMS using mobile devices had, on the other hand, commented that the interface is more usable, touch-screen friendly, simpler and easier to use. Some of the teachers and content creators have also had positive feedback (while using the LMS on mobile devices for grading, giving feedback and using previously created activities and resources).

So keeping a balance between desktop and mobile users is our main challenge. Still, the majority of the students are moving towards mobile device use. Although pandemics was the main motivator and trigger towards massive transfer to mobile devices, users have also discovered the benefits and decided to use it even further in the future. So, our chosen approach is to raise awareness among the desktop users, majority of them being the professors and teaching staff, that there is a necessary shift ahead to mobile environment and adaptation of the learning objects / content. In order to scientifically prove this position, we have conducted a research that showcases our statements with numbers.

II.

MATERIAL AND METHOD

ESC had previously ran a 3-year survey on first year undergraduate students enrolled at FHSS during the initial LMS training in academic years 2020 to 2022 (held in September each year, before the classes start) regarding the devices and other equipment that those students possess in order to try to prepare the teachers, educational software solutions and infrastructure to students' needs. LMS initial mass-training for undergraduate students has been running since 2013 and has proven to be an effective way to quickly introduce freshmen to LMS and educational technologies present at the FHSS. From 2013 it was run in 45 30-minute workshops in PC labs, and since 2019 it was moved completely online, and now it lasts 10 working days (about 3 hours workload total). Survey was done using MOODLE Feedback activity, and over 90% of first-year students each year have answered. It was an 11-question anonymous survey, with questions ranging from device types they are using (desktop, laptop, smartphone, tablet - multiple possible devices), age of those devices, operating systems (on all devices that they possess), and what type of internet connection are they going to use to access online services at FHSS (if they had that information). Primary motivation was COVID-19 measures and online classes in 2020, but it continued later on because it provided valuable information for both teachers, ESC and FHSS management. The number of surveys submitted per year: 2020 - N = 721, 2021 - N = 709 and 2022 - N = 698 (total of 2128).

Additional survey was also run for 3 years in academic years 2020 to 2022 regarding the speed of the students' internet connection, where first-year students had to use OOKLA Speedtest website [13] to measure their current

speed and submit the result, also using MOODLE Feedback anonymous activity. The number of surveys per year is similar to the device type survey, but we are only using the sample of 100 submitted surveys per year in this article (total of 300).

In 2023, both of those surveys will be integrated and additional questions will be added, regarding the UX / UI and development and implementation of new LMS features, as well as accessibility issues/customizations. Additional survey for teachers and content creators on similar topics will also be implemented later this year as a longitudinal study.

III. RESULTS

As mentioned before, the number of surveys submitted per year was: 2020 - N = 721, 2021 - N = 709 and 2022 - N = 698, with total of 2128. When it comes to device distribution among the student population as presented in Figure 1, the least number of students were using tablets (from 24 in 2020 to 33 in 2022). The limiting factor of those devices could be their price and battery duration, as well as limited connectivity options (the low-cost models are limited to Wi-Fi only). Desktop users were following, with a visible decline in numbers (from 139 in 2020 to 96 in 2022), which could be explained with their limited mobility (for students originally living outside Zagreb, the university center), size and price, when compared to laptops and mobile phones. Laptops number is also declining, but not as rapidly (from 613 in 2020 to 581 in 2022), especially given their large initial numbers. They are mobile, can be carried to classes, they have multiple connectivity options and can be considered cost effective. And finally, smartphones are also showing a slight decrease in numbers (from 623 to 602). They are portable, can be carried to classes, they also have multiple connectivity options, but some models are rather costly.

Number of devices with smaller screens (smartphones, tablets, and to some extent laptops, especially ultra-portable models) are overwhelmingly present in the student population. Designing UI and UX in general with the “mobile-first, every other platform later” idea seems to be prudent, giving the students opportunity to enjoy almost all of the UX facets mentioned before: LMS becomes more useful, usable, desirable, valuable, findable, accessible and credible. The devices they are using are also shaping the content the teachers, content providers and institutions are creating and customizing for their consumption. It does also mean that there is still a

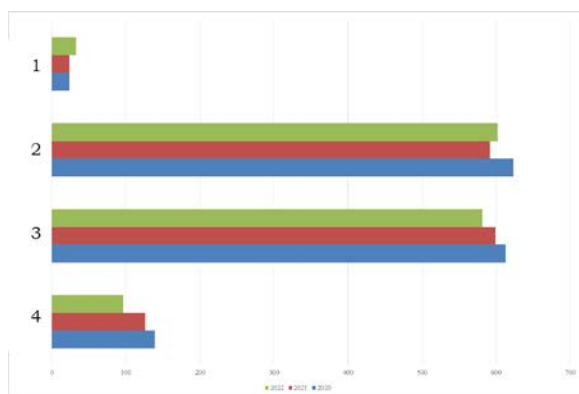


Figure II. What type of device are students using to access educational technologies at FHSS. Legend: 1 – tablet, 2 – smartphone, 3 – laptop, 4 - desktop

need to design / customize UI also for students / learners who are still dominantly using desktop or large screen devices (be it because of the financial or other reasons).

Internet access speed was also measured by the students, using OOKLA Speedtest, preferably on the devices and on the location where they will be living while studying at the University of Zagreb (private accommodation, dorms). Although the number of surveys per year is approximately the same as the device used survey (around 2100), we have taken a sample of 100 surveys per year. All the results presented in Table I. were submitted as the OOKLA Speedtest URL, so there are no ambiguities or mistakes that could be present in manual result entry. When compared, average download and upload speed in 2022 (47.29 Mbps / 19.16 Mbps) is almost twice as high as the speeds in 2020 (26.72 Mbps / 11.41 Mbps). Maximum download and upload speeds have risen significantly (92.98 Mbps / 53.83 Mbps in 2020 to 240 Mbps / 124.04 Mbps in 2022), probably as a result of wider introduction of fiber optics home connectivity in Croatia during that period. Minimum download and upload speeds measured are really low, barring any meaningful use of the internet, let alone online educational technologies (from 1.56 Mbps / 0.27 Mbps in 2020 to 4.54 Mbps / 0.32 Mbps in 2022). Upload speeds in general need to be much higher, especially if students and teachers are to use video conferencing or any other modern communication two-way tools that have become more and more a standard recently.

TABLE I. STUDENT INTERNET CONNECTIVITY SPEED RESULTS, SEPTEMBER 2020 – SEPTEMBER 2022

	September 2020	September 2021	September 2022
	Mbps	Mbps	Mbps
Minimum download speed	1.56	2.08	4.54
Minimum upload speed	0.27	0.34	0.27
Maximum download speed	92.98	211.12	92.98
Maximum upload speed	53.83	124.81	53.83
Average download speed	26.72	41.39	26.72
Average upload speed	11.41	20.09	11.41

Some of the measured students' internet connectivity speeds paint a clear picture on why certain parts of the student population are not willing or able to use online educational tools, and why they are having issues with teachers and institutions asking them to use those tools on a daily basis. When it comes to UX / UI issues and their slow internet connections, some students are reporting (through support tickets to ESC) that their older desktop and laptop computers are having issues rendering certain types of audio-visual content (both real time AV content or pre-recorded material).

IV.

DISCUSSION

One of the main LMS usage goals is teaching and learning, in a structured way, using modern pedagogy and available technologies (and emphasis should be on modern pedagogy and less on “cool” technological solutions). In order to teach someone, it is important to make them feel at ease with the tools used in the classroom or learning environment, be it digital or physical room. UX design, adaptation and analysis of current LMS could help teachers and students alleviate certain issues regarding usability, usefulness, accessibility and other UX facets when it comes to using LMS in everyday educational contexts. As stated before, since the upgrade to MOODLE 4.x, a number of FHSS users had expressed their comments and complaints, most of those negative comments / complaints coming from teachers and content creators using desktop computers, while students mostly had positive feedback. Since UX design in MOODLE 4.x was oriented towards mobile device users (and they are in our case mostly students), issues arising for the desktop users were to be expected. Some of the issues could be solved using instructional design principles when creating activities and resources in online courses, ie. a number of teachers were having issues with “too tall course content, because several pages long/tall course became much longer” - meaning, for each link and icon combination on the previous MOODLE interface that was in 1 row, in MOODLE 4.x it was presented in 2.5 to 3 rows space. Needless to say that those changes were made both for touchscreen usability and screen reader software for students with vision impairment issues. Upon inspection of those courses, it was obvious that even before the software upgrade of the LMS, there were serious issues regarding the large number of activities and resources present (with 30-50% of those activities and resources being from previous semesters and hidden from students, so only teachers had issues with scrolling pages and pages of activities and resources, while students only saw actual, not hidden materials). In the MOODLE community, very long courses, rich with numerous resources and activities that keep students and teachers scrolling for a long time in order to find something is called “the scroll of death” [14] and it should be avoided because of the information overload it presents on the users. So, part of the issues that teachers are having could be resolved by changing the course design / structure to better suite their needs, while also removing the unnecessary activities / resources from the previous academic years (decluttering the course home page in the process).

V.

CONCLUSIONS

Large number of FHSS students are using mobile devices and small screen devices to access our MOODLE based LMS Omega, and the implementation of MOODLE 4.x version oriented towards mobile touchscreen users has helped them to use the system in a more efficient and easy way. Most of their previous UX / UI issues that students have faced are not gone completely, but are mitigated to a large extent, with possible improvements in announced MOODLE releases with UX issues in mind.

On the other hand, since most FHSS teachers and content creators are using desktop computers for their content developing and creation purposes, ESC will have to find possible solutions for their UX issues.

Some of the solutions include: further webinars and education events for teachers on UX changes in MOODLE 4.x onward, tips and tricks for desktop users on internet browser / operating system solutions and tools, information on reasons why those changes were needed (majority of students using mobile devices, accessibility improvements for visually impaired users and so on), also education on using instructional design principles that could help alleviate some of the “the scroll of death” situations, and probably selection and customization of a new MOODLE 4.x theme for desktop users.

Our future research in UX/UI design and LMS Moodle will definitely include standardized UX satisfaction surveys and cover the device types used (models and year of production).

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